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(54) **A method of manufacturing porous filter elements**

(57) A porous filter element is formed by superimposing upon one another a plurality, for example thirty-five, filter discs (1) of woven wire or other porous construction, and compressing the discs together so that the individual filter discs lose their initial forms and aperture sizes. The element (6) may have a surrounding frame (5) and may if desired be sintered. The element may support a sand bed in a spinnerette nozzle (Figure 6 not shown).

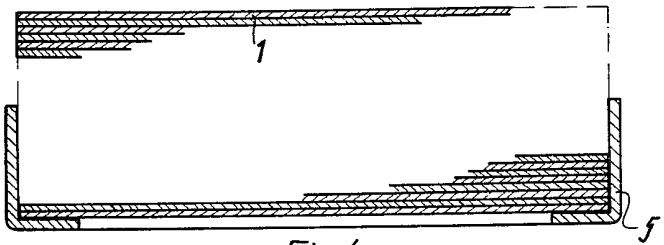


Fig. 4

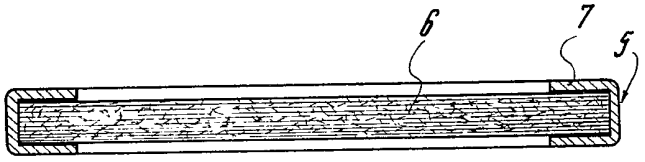


Fig. 5

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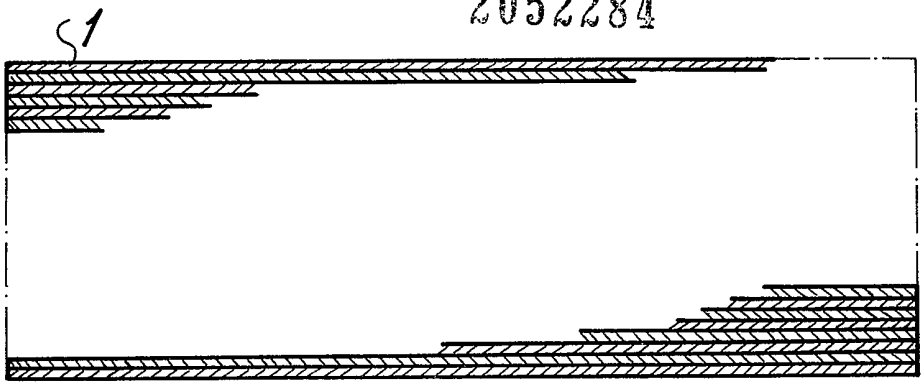


Fig. 1

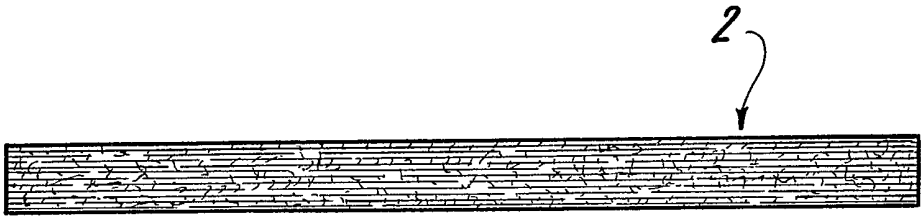


Fig. 2

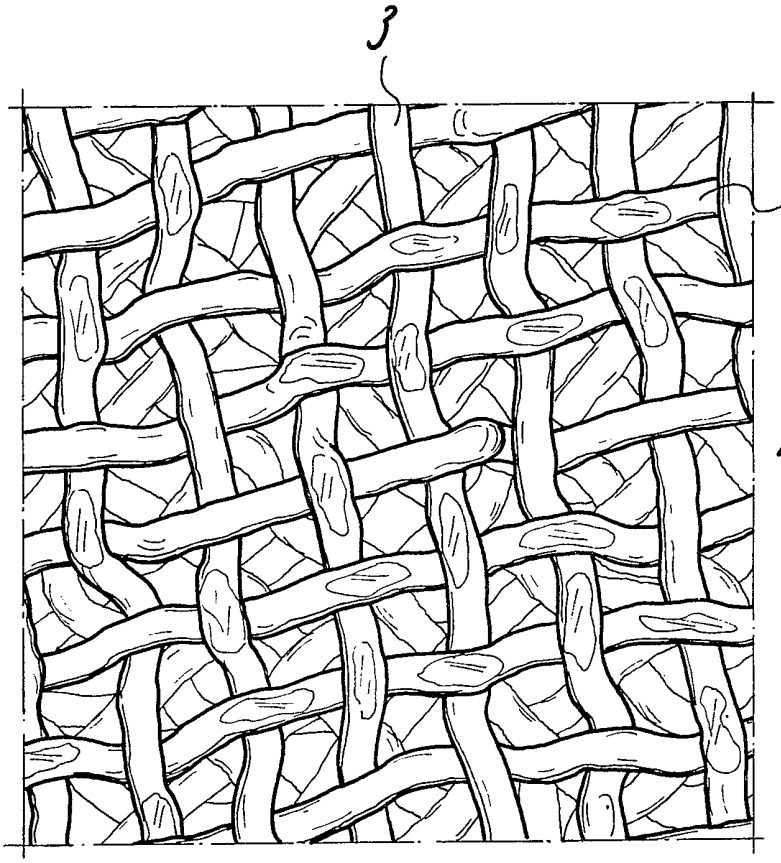


Fig. 3

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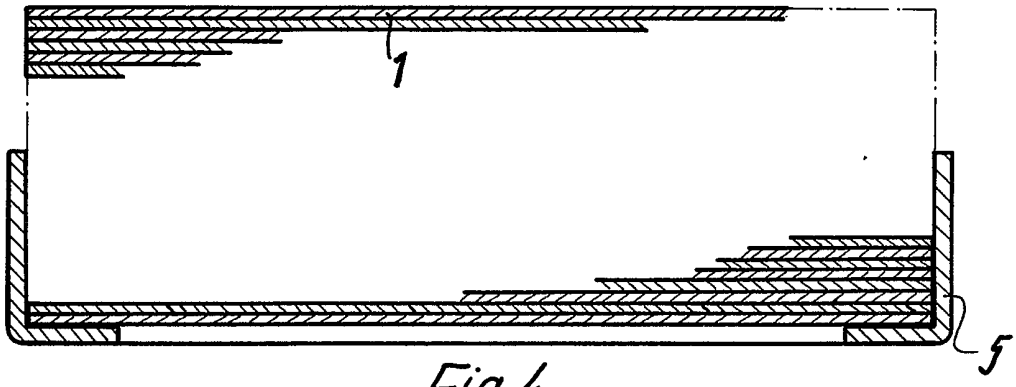


Fig. 4

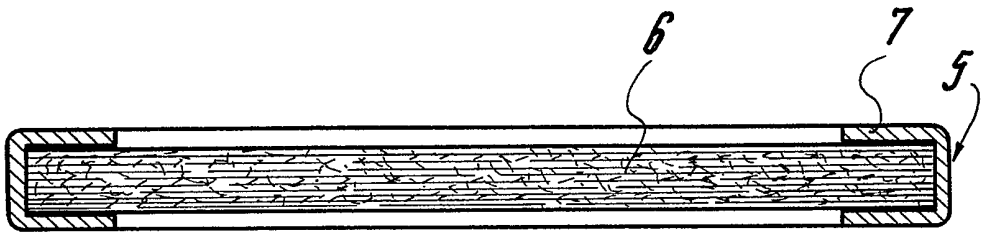


Fig. 5

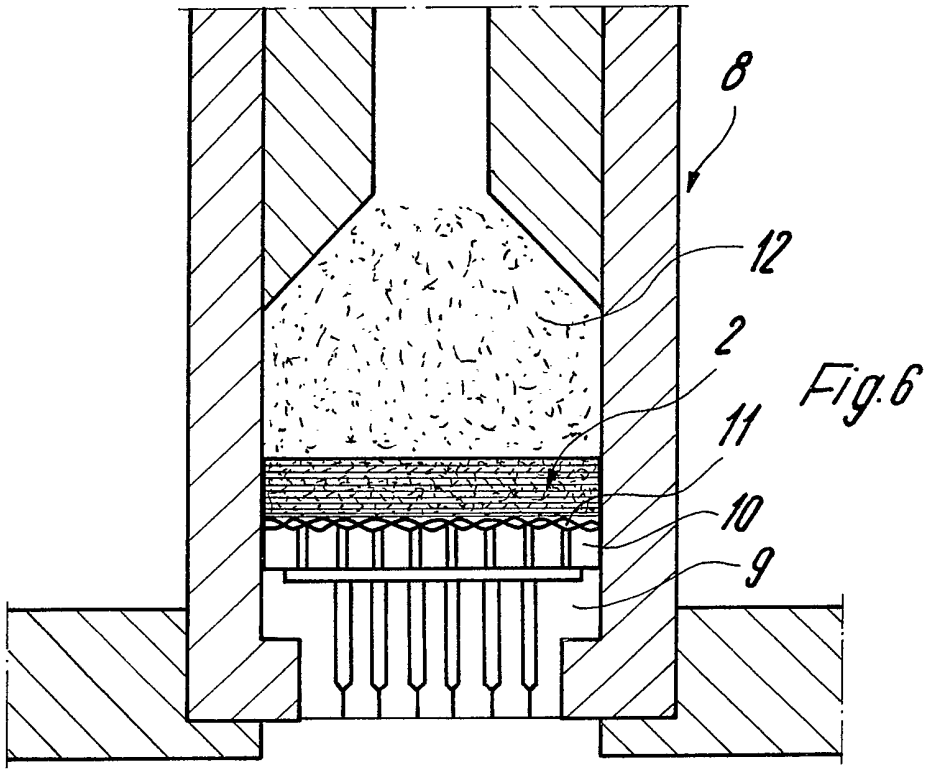


Fig. 6

SPECIFICATION

A method of manufacturing porous filter elements

The invention relates to a method of manufacturing porous filter elements.

One previously proposed method of manufacturing such elements comprised superimposing upon each other a large number of filter discs made of woven wire of similar or dissimilar aperture size in a desired sequence within a frame, and then closing the frame.

Further, it is a recognised practice from published German specification 23 18 190.0-27 to provide, so as to exert an all-round sealing effort on the filter discs. The filter discs may be round, oval or may have other desired geometrical form, according to application requirements.

Unfortunately, after closure and compression of the metal frame the individual filter discs do not lie firmly upon each other, and often rise in pillow shape above the metal frame, thus preventing uniform flow through the filter and exerting a detrimental effect on the effectiveness of filtration and rate of blockage.

According to the invention there is provided a method of manufacturing a porous filter element comprising superimposing upon one another a plurality of filter discs of woven wire having similar or dissimilar aperture size, or a number of layers of non-woven metal fabric, metallic skeletal material or a fill of macerated wire, compressing the filter discs together at high pressure so that the individual filter discs lose their initial forms and aperture sizes and are converted into a porous filter element, the porosity of the element being determined by the magnitude of the pressure.

Such a method can produce a porous homogeneous filter element having a pore volume which will remain constant under the most variable operating conditions, and providing filtration of unusual efficacy.

The high pressure causes plastic deformation of the individual filter discs, which to some extent flow together, so that the shape of those parts, *e.g.* wires, determining aperture size is changed, together with their attitudes. The higher the pressure by which the individual filter discs are loaded during conversion to a homogeneous filter element, the smaller are the pores of the resulting filter element.

A porous filter element according to the invention can have the layers formed by the filter discs of constant form after compression, and therefore, in contrast to existing woven wire filter combination layers, need have no likelihood of deformation, displacement or lifting under mechanical loading. Thus a homogeneous flow of a liquid or of a smelt over the entire section of the filter area can be obtained.

The filter discs which are compressed together can comprise any combination of even widely varying kinds of mesh material as regards aperture size, weave or metallic composition. They can be especially suited to the filtration requirements for plastics smelts or spinning solutions used in the making of synthetic filaments or threads.

It is possible to enclose the filter element in a metal rim, made of, for example, aluminium or stainless steel.

The invention is diagrammatically illustrated by way of example in the accompanying drawings, in which:

Figure 1 shows a first stage of the method of the invention wherein filter discs are superimposed on each other before pressure is applied;

Figure 2 shows a porous filter element obtained after a second, compression stage of the method of the invention, in vertical section;

Figure 3 shows part of a horizontal section of a porous filter element made by the method of the invention;

Figure 4 shows filter discs before compression placed in a sheet metal frame open at the top;

Figure 5 shows the porous filter element obtained from the set of filter discs of Figure 4 and with the metal frame closed;

Figure 6 shows a spinning apparatus, in vertical section, equipped with a porous filter element made by the method of the invention.

Figure 1 shows a first stage of the method of the invention, wherein filter elements 1, made, for example, from woven wire mesh, are stacked on top of one another. It is advisable to heat-treat a sheet of woven wire mesh before punching out the filter discs, to ensure that the discs lie flat.

The filter package shown in figure 1 is then compressed under high pressure to form the filter element 2 shown in Figure 2, the press tool being suited to the shape of the filter and operating uniformly over the whole filter surface. The pressure is determined, among other criteria, by the nature of the filter discs, by the fabric or similar material used in making the filter discs, by the size of the filter discs, and also by the size of the particles which are to be filtered out by the filter, since the pressure decides the pore size of the filter element resulting from the method.

In Figure 3 is may be seen that after compression of the filter discs the wires 3, 4 of the wire mesh of the filter disc running in the warp and weft directions have changed their attitude and also their shape. Plastic deformation resulting from the compression has not only created intimate interconnection between any two neighbouring filter discs, but also has stabilized the form of the complete filter element.

Figure 3 also demonstrates how the aperture sizes of each filter disc have been altogether changed by the process of compression.

In the example illustrated in Figures 4 and 5 a stack of filter discs 1 is laid within an open metal frame 5. The stack of filter discs is then subjected to a high compressive pressure, and is deformed into the porous filter element 6 shown in section in Figure 5. The upper side of the metal frame 7 is then folded over, thus

providing a metal frame as shown in Figure 5 for the filter element 6.

Figure 6 shows the porous filter element 2, made by the method of the invention, in a spinning apparatus 8. The spinning apparatus 8 is equipped with a twenty-hole nozzle 9 (bore diameter 0.28 mm). Above the nozzle 9 there is a distributor plate 10 and a protecting screen 11 with sixty apertures per cm^2 immediately below the filter element 2. The space above the filter element 2 is filled with sand 12 of 1mm particle size. Pressure in the spinning apparatus, measured by a needle-type mean pressure indicator, amounted initially to 140 bar. After 23 days operating time pressure rose to 218 bar.

The filter element 2 incorporated in the spinning apparatus and made by the invented procedure consisted of 35 layers of mesh in the following sequence:

1 layer	:	aperture size 0.4 mm, wire diameter 0.22 mm.
30 layers	:	aperture size 0.09 mm, wire diameter 0.05 mm.
1 layer	:	Minimesh RPD 17.
2 layers	:	aperture size 0.09 mm, wire diameter 0.05 mm.
1 layer	:	aperture size 1.12 mm, wire diameter 0.32 mm.

Material 1.4301.

The compression pressure amounted to 30 tonnes.

The porous filter elements made by the invented procedure may also be subjected to a sintering process.

CLAIMS

1. A method of manufacturing a porous filter element comprising superimposing upon one another a plurality of filter discs of woven wire having similar or dissimilar aperture size, or a number of layers of non-woven metal fabric, metallic skeletal material or a fill of macerated wire, compressing the filter discs together at high pressure so that the individual filter discs lose their initial forms and aperture sizes and are converted into a porous filter element, the porosity of the element being determined by the magnitude of the pressure.

2. A method according to claim 1, including the step of sintering the porous filter element.

3. A method according to claim 1 or claim 2, wherein the plurality of filter discs are initially laid in an open metal frame and, after the compression under high pressure, the upper edge of the metal frame is folded over onto the porous filter element to close the frame.

4. A method of manufacturing a porous filter element as claimed in claim 1 and substantially as hereinbefore described.

5. A porous filter element formed by the method of any one of the preceding claims.

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